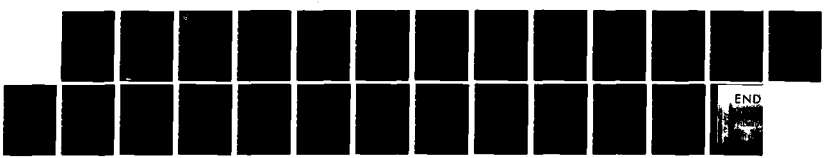
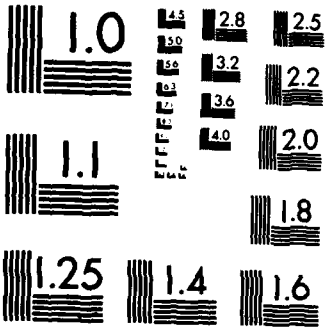
AD-A134 395 THE VLATME SYSTEM ANALYSIS RECOMMENDATIONS AND CONCLUSIONS(U) AIL FARMINGDALE N Y DEC 78 DAAB07-78-D-2404 1/1

UNCLASSIFIED F/G 15/7 NL





(1)

THE VLATME SYSTEM

ANALYSIS, RECOMMENDATIONS AND CONCLUSIONS

FINAL REPORT

December 1978

Prepared Under Contract Number
DAAB07-78-D-2404 D0-0003

AIL, Division of Cutler-Hammer, Inc.
Farmingdale, Long Island
New York 11735

DEPARTMENT OF THE ARMY
US ARMY AVIONICS RESEARCH AND DEVELOPMENT ACTIVITY
FORT MONMOUTH, NEW JERSEY 07703

29 AUG 1983

DAVAA-C

SUBJECT: Contract DAAB07-78-D-0240

Administrator
Defense Technical Information Center
ATTN: DTIC-DDAB
Cameron Station BG 5
Alexandria, Virginia 22314

1. Reference your letter dated 20 July 83 (Encl 1).

2. Subject contract was mainly for maintenance and repair of experimental Air Traffic Management Equipment. One of the delivery orders, however, was for an evaluation of the use of this equipment. Per your request, the final report of that evaluaton is enclosed (Encl 2).

2 Encl
as

FOR JOSEPH T. SAGANOWICH
Chief, Command, Control and
Communication Division

MAJOR CORNELIUS J. WESTERHOFF
C3 Division
AVRADA

DISCLAIMER NOTICE

THIS DOCUMENT IS BEST QUALITY PRACTICABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

PART I MISSION ANALYSIS

A. DISCUSSION

Each member of the family of Army aviation units performs at least one of the five functions of land combat: firepower, mobility, intelligence, command and control, and combat service support. Future Army aviation tactical missions can be expected to vary little from those of today. Granted, the high threat battlefield projected for the future will force changes in tactics and equipment; but the basic missions will be the same. Army aviation resources, by their very nature, are expensive and therefore not limitless. Commanders have always been, and always will be faced with resource constraints which force very tough tactical decisions on their part. How effectively a commander manages limited resources then can often determine the outcome of the battle. ~~In all probability~~ Most likely, we will have to fight the first battle of the next war against an enemy, superior in numbers, who is at least our equal in technology. The importance of winning that first battle cannot be overstressed. Resource management ~~will play~~ an important role in this battle.

The tactical missions were analyzed with this resource management requirement in mind to determine if, in fact, a VLATMS derived system would be beneficial. All attempts to overlay an Air Traffic Control system as we know it today proved futile since peacetime practices and procedures could not be readily extended into the high threat first battle environment.

→ [illegible] than offset by the structuring and employment [illegible] present Air Traffic Control system.

~~It was therefore decided to~~ This document takes a fresh look at the problem from a purely asset management standpoint with the commander as the key "player" with ready access to real time information relative to his Army aviation assets. Any restrictions imposed must be by the commander and not by a system of rules, procedures and hardware. Given the proper tools, it was felt that the commander could structure a management system to suit his needs and modify that system as the tactical environment dictated. In this manner the classic objections to air traffic control or management should be reduced or eliminated, while still giving the pilots access to that degree of assistance required for the safe and expeditious completion of their mission. Creating a system that was highly mobile, simple and capable of providing accurate, real time assistance was obviously the goal. Any such system must be capable of expansion at the discretion of the commander into a more sophisticated management system without greatly increasing equipment complexity. The system must exist solely to support in the varying degrees required. It must not exist as an end unto itself. It must be a true aviator assistance package which enhances the commander's ability to manage his assets in real time.

No attempt was made here to determine the mix and total number of units or components which would make up such a package.

Rather it was [illegible] be available per division and sufficient "A" [illegible] units available throughout the division to provide the necessary support deemed essential for this analysis. It is worthy of note however that, during the analysis, it became clear that at last one "A" type device would be desirable at each unit capable of (or conducting) independent operations. The employment of the "A" units is to be strictly controlled by the commander on the scene and would probably not be employed unless assistance was requested by the aviator.

Four basic missions are included here for review. Each mission was extracted directly from FM 90-1, "Employment of Army Aviation Units in a High Threat Environment" (30 Sep 76). These were selected for their representative nature, narrative format, and their community acceptance. Although general in nature, they serve as an excellent vehicle for the analysis. VLATME comments have been interjected throughout these mission scenarios. Quantitative improvement levels resulting from the employment of a VLATME derived system could not be determined. Since the system is intended only to be used at the direction of the commander or on request of the aviator (i.e., there is some problem) it can be concluded that mission effectiveness was substantially enhanced by the use of the system.

Many more "type" missions could have been included but it became readily apparent that a VLATME derived system, with an

absolute minimum of "air [illegible]", accurately and in real time. The basic [illegible] "A" units can be used to put an aircraft precisely over a desired point with minimum emissions. Any mission requiring the arrival of an aircraft at a specific point, (which may not be well defined) such as medical evacuations, pick up of personnel behind enemy lines, delivery of mixed supplies at multiple points, the list goes on and on, "is a natural" for VLATME "A" units. "B" and "C" units will be best employed in areas of high or relatively high density air traffic such as airfields, supply points and FARRPs; anywhere the commander decides that he requires some form of terminal traffic management or flow enhancement. It must be constantly remembered that the 'system' so derived is employed to assist the aviator and at the discretion of the commander.

B. FOUR MISSION SCENARIOS

1. Unit: Attack Helicopter Company/Battalion

Action: Reinforcement

Problem: To reinforce a battalion threated with a penetration by enemy armor.

MISSION

Situation: A U.S. armored division is defending in the main battle area on the northern flank of the corps with three brigades forward and a reinforced task force in reserve. Battle has been heavy and the enemy has shifted his emphasis from the planned main attack in the south where it met stiff opposition when the division reserve was committed. The enemy committed his

reinforcements to the [illegible]
brigade is strained to hold. A penetration [illegible]
battalion area astride the enemy main thrust line. [illegible]
helicopter battalion from corps which was committed in the
south is detached from the southern division and attached to
the northern division. As advance elements of the attack
helicopter battalion arrive in the division area, the main
battle area of the threatened battalion is penetrated. The
division commander directs that the attack helicopter battalion
be OPCON to the northern brigade. The brigade commander placed
the first attack helicopter company to arrive under the operational
control of the penetrated battalion.

SOLUTION

Attack helicopters of the company block to stop the enemy advance and then assist ground forces in reducing the enemy penetration and reconsolidating the main battle area.

HOW: The commander of the attack helicopter is quickly briefed on the situation since time is critical. A detailed reconnaissance and thorough coordination with ground forces in contact is not possible. Since only the attack helicopter battalion command group and one attack company arrived, refueling must be accomplished using division resources. Corps CH-47s are enroute with additional FARRP equipment to reduce turnaround time for the company, and later, the battalion. The attack company is immediately committed against the penetration.

Movement to the [illegible]
contact was conducted at NOE altitudes
with final vectoring to the target area
being accomplished by hand held VLATME "A"
units operated by the units in contact.

So numerous were the enemy targets that the attack company had expended all missiles in 20 minutes of combat. The company was quickly relieved by another which had just arrived and returned to the FARRP to rearm and refuel and await recommitment.

During emplacement of the FARRP a
VLATME "B" unit was located at an
offset point (for security) to assist
traffic in the area. "A" units were
placed forward of the FARRP to serve
as gap fillers and vector requesting
aircraft "into a predetermined approach
window." Corps CH-47s were initially
vectored to the FARRP site by "A" units.

Attack helicopter elements coordinated their fires with ground forces (using VLATME "A" units to assist in attack position vectoring as needed) and the enemy advance was halted. Attack helicopter units were now being cycled through firing, rearming, refueling, and ready process at a rapid, steady pace-allowing ground forces in the area to regain balance and initiate efforts to reconsolidate their defenses in depth.

ANALYSIS

Timeliness of action was a major contributing factor to the success of this operation. When time-distance factors preclude commitment of ground forces to counter the penetration, attack helicopter units can cover extended distances and be prepared to fight in a minimum of time, thus allowing ground elements time to reconsolidate the main battle area. Controlled employment of VLATME units can greatly assist in reducing the time required to get on station in circumstances like this. The very nature of this type of action makes victory extremely time dependent. Target locations continually change and major threats can build in a matter of minutes. Forward ground elements can accurately vector attack helicopters to their positions or to offset positions with VLATME "A" no matter how frequently they move. Controlled employment of VLATME "A" in situations such as this is much more accurate and less time consuming than the standard map reference technique - especially in the heat of battle. Should the FARRP be forced to relocate during the action it might be possible to leave the "B" unit in place and still fulfill its mission of terminal assistance. Gap filler "A" units could readily be moved as the situation dictated.

2. Unit: Assault Helicopter Company

   Action: Movement of antitank teams

   Problem: To provide an additional antitank capability to airborne infantry units heavily engaged with an enemy armor force.

MISSION

Situation: A major enemy breakthrough in the [illegible] sector has exposed the right flank of a U.S. corps. [illegible] armor avenues of approach through mountain passes [illegible] the major enemy routes into the corps flank. An airborne [illegible] task force was quickly deployed and is defending until mechanized reserves can be committed. The airborne task force is heavily engaged with a reinforced motorized rifle regiment and is urgently in need of the additional antitank capability. Unless the task force receives additional antitank reinforcements with TOW and DRAGON weapons, it will not be able to hold its present position. Because of time and distance factors, ground transportation of antitank teams is considered untimely. The teams must be moved by air.

SOLUTION

A corps assault helicopter company is assigned the mission of airlifting the antitank teams. The teams are from the mechanized infantry battalion which is moving up from corps reserves to assist the heavily engaged airborne battalion. The pickup of the teams is coordinated with the mechanized battalion by the assault helicopter air mission commander.

> Complete coordination with the airborne battalion cannot be effected, leaving the precise location(s) of the landing zones in doubt. VLATME "A" units will be used to guide the aircraft to the landing zones as needed.

[illegible] Pl[illegible]ms is carried out [illegible] helicopters fro[illegible] company provide overwatch as [illegible] helicopters using [illegible] flying techniques move to the landing [illegible] area. Multiple landing zones have been selected as far forward as possible without risking unnecessary exposure to enemy air defense weapons and compromise the nature of the reinforcement.

> Personnel from the airborne battalion secure and mark the landing zones for the inbound aircraft. Final vectors from a point approximately five kilometers away are provided by the airborne battalion personnel using VLATME "A" units as required. This "service" is "on request" by the assault helicopter company.

Attack helicopters provide suppressive fires, as necessary, during the landing zone operation. Several wounded are placed on the outgoing helicopters for evacuation.

> The evacuation helicopters are vectored to a recently established medical facility in the brigade area for treatment and transfer to medical channels. Vectoring was accomplished by a VLATME "B" unit emplaced in the brigade rear area. With corps units probably being unfamiliar with the area, this assistance might well make a significant difference to the wounded.

The assault helicopter company provided the means to move the antitank fire power to the point of critical need in time for it to be effective. Timeliness of action was a major contributor to success. Placing the correct fire power at the correct point (asset management) allowed the airborne battalion task force to repeatedly repulse attacking armor forces and hold the critical terrain until additional combat power arrived. Employment of the VLATME "A" units by the task force commander gave him greater flexibility in selection of landing zones - allowing him to adjust the number and mix of arriving antitank teams to the severity of the threat at that time.

3. Unit: Assault Helicopter Company

Action: Raid behind enemy lines

Problem: To secure key facilities and conduct ambushes behind enemy lines.

MISSION

Situation: A U.S. airborne division has been successfully defending key mountain passes on the southern flank of the corps. Enemy forces attacking in that area have been beaten back repeatedly by elements of the division and intelligence reports indicate mounting morale problems among the enemy troops caused by a shortage of food and warm clothing and generally undependable resupply lines. The situation is ideal for an attack. The corps commander directed that the division prepare to attack by conducting raids behind enemy lines to secure key locations, destroy selected bridges, locate lucrative long-range artillery targets, adjust

artillery fi[illegible] of opportunity [illegible] conduct [illegible] resupply [illegible]. The division commander directs that one assault helicopter company from the combat aviation battalion be placed under the operational control of the 2d brigade.

SOLUTION

The assault helicopter company airlifts selected assault teams into rear areas behind enemy lines to secure key bridges, attack supply lines and command posts, and conduct disruptive operations in general. The success of this operation will contribute to the overall success of the division attack.

HOW: The 2d brigade commander designated that a company-size force be used for the raids. The commanders of the airborne company and the assault helicopter company are briefed on the enemy situation and objectives by the brigade commander. Plans and preparations are made for the operation. Since the small key objectives are behind enemy lines, heavy reliance on map reconnaissance is necessary. The air defense threat is evaluated carefully and the operation is planned to take advantage of the low ceilings and patches of ground fog in the early morning hours to lessen the threat from enemy high performance aircraft. The aircraft pick up the teams just prior to dawn and proceed by multiple routes to the preselected objectives. Release points along each route are marked by VLATME "A" units. An attack helicopter and a scout aircraft from the aviation general support company of the combat aviation battalion accompany three of the lifts and provide overwatch through areas of greatest risk. The

other [illegible] relying only on their door gunners for protection [illegible] small arms fire. The lifts are placed on reverse slopes of enemy positions in order to minimize detection and hostile fire. The lift aircraft employ the techniques of terrain flying, using the terrain to mask their routes of flight and protect from enemy air defense threats. Since the assault helicopter company was able to lift all elements of the company conducting the raids in a single lift, risk of enemy detection was minimized. Operation plans included [illegible] pickup points for extraction of the teams upon completion of their mission.

> During the insertion phase of the operation VLATME units would receive little play. Their only advantage would be in establishing accurate on call "way points" along the multiple routes to assure separation, timing and some degree of command control (if required). During the extraction phase, the VLATME "A" units would be used to assist (on call) pilots in locating the pickup points. This would be extremely valuable in cases when teams could not reach their predesignated points.

ANALYSIS

The assault helicopter company provided the means for many small airborne teams to be simultaneously airlifted along a multitude of routes into enemy rear areas. If required, VLATME

especially during [illegible] visibility. The [illegible] commander could use these pilots to accurately establish location and timing of his assault troops, to coordinate artillery fires, or other diversions. It would be the commander's tool. This coordinated action would, in effect, saturate the enemy rear area with a number of small but disruptive hit-and-run battles and highly accurate observed artillery fires. The extraction phase would be the most difficult. Just as this raid was planned to be disruptive to the enemy; the enemy could be very disruptive to our plans for extraction. Unexpected enemy concentrations for example could force the commander to change the pickup site. Vectoring by the raiding parties VLATME "A" unit would bring the pickup aircraft to the proper pickup zone with a minimum of error. Attack helicopters and air force strike aircraft could likewise be vectored to prime targets of opportunity during the mission. Returning forces could be vectored around new "problem areas" by "A" or "B" units along the FEBA. The compactness of the "A" unit make it ideal for this type of operation. Its employment, being strictly controlled by the ground commander in no way restricts his freedom of action, but rather enhances this freedom by assuring that the air assets are at the right place at the right time.

4. Unit: Assault Support Helicopter Company

   Action: Displacement of logistics

   Problem: To reposition essential ammunition and fuel forward to resupply attacking forces.

U.S. armor and mech[illegible] an enemy motorized [illegible] and pursuit action. [illegible] A[illegible] for the [illegible] resupply of critical ammunition and fuel must be [illegible] or the pursuit will have to be slowed and, perhaps, [illegible] maximum. Resupply points must also be relocated in order to sustain the operation and hold the initiative. The division requests aviation element support from corps to assist in the airlift of supplies and relocate supply points.

SOLUTION

An assault support helicopter company airlifts critically needed class III and V logistics to the front lines to resupply armor and mechanized forces. Air elements can easily negotiate the terrain obstacles in order to close the supply [illegible].

HOW: The division is provided one assault support helicopter company consisting of 16 CH 47 aircraft to support the operation. The DISCOM commander is given operational control over the company in order to best coordinate and direct its actions.

> During this type of activity it can be expected that the division area will be a "bee hive" of

air [illegible]
would be invaluable [illegible]
aid. Since it is doubtful that an operation of this nature will be restricted to periods of good visibility only, some form of terminal advisory service will be essential. A network of smaller "B" units can also be displaced forward to operate as small terminal advisory units for forward resupply points.

Close coordination with the assault support company allows maximum economy of use of the medium-lift helicopters. Some aircraft are quickly loaded internally with pre-packaged, containerized loads of critical ammunition, while others sling load large fuel bladders externally. The helicopters carried the loads to the forward areas remaining below the enemy air defense threat by employing the techniques of terrain flying.

The rapid advances of the attacking force will put unusual demands on the supply system. Just finding the proper place to deliver them can be a problem. The commander of the attacking force can accurately position those supplies by use of VLATME "A" units accompanying his troops. Accurate resupply point coordinates are not essential since the 'A units' can vector aircraft from several kilometers out. In this way the proper supplies get delivered to the point

where they [illegible]

long past predesignated point for [illegible]

they must be moved again.

As soon as immediate resupply needs were satisfied, the assault support helicopter company concentrated its efforts on relocating supply points well forward so that dependence on ground resupply could resume.

One forward located VLATME "B" unit could perhaps provide terminal advisory services for more than one of these supply points.

Coordination between DISCOM and the division engineer element allowed movement of needed bridge and culvert repair material to be moved direct to the construction site prior to releasing the assault support helicopter company back to the corps.

Again, VLATME "A" units at the delivery sites could expedite the operation. They would be on call and used only when needed.

Proper transponder coding by load type could help assure that the culverts arrived when they were needed, not at bridge sites and vice versa.

ANALYSIS

The pursuing armor and mechanized forces were able to retain the momentum of the attack by being resupplied at the front lines. The operation could sustain itself since the assault support helicopters also relocated supply points well forward thus

[illegible] type of operation is a "natural" [illegible] employment of all configuration of VLATME. The larger, more stationary "C" unit at division provides the necessary terminal advisory assistance (control if directed by the commander) with the smaller "B" units working the forward resupply points. The hand held "A" unit, employed directly by the troops who need the supplies can serve as a "magnet" for the resupply aircraft getting them to the point where they are really needed. Employed in this way the commander has control of his resupply situation, putting his assets where they are needed, when they are needed.

PART II EXISTING EQUIPMENT MODIFICATION

DISCUSSION

Observation of direct user tests during the period of this contract was possible only once. The often postponed user CEP was completed during October 1978 at Fort Rucker, Alabama. Discussions with participants revealed a high degree of general acceptance of the equipment, confirming earlier comments. Many objections to the equipment were overcome by the direct hands on experience offered by the CEP. Should the user decide to pursue the VLATME concept as a result of this test the following areas are listed for consideration of the developer.

1. A capability of keyboard entry of information such as tactical call signs (for display) should be included on the "C" version at a minimum. The lack of this ability has caused some operator difficulty.

2. [illegible] the VLF general scheme [illegible]. Consideration should be given to including a mode 4 capability. Additional investigation into the practicability of this suggestion is required to determine its usefulness and validity.

3. There appears to be a multiplicity of problems with the method of displaying (or overlaying) map information on the existing "C" display. The "how much" and "what kind" questions should be settled face to face with the proponent to avoid lengthly and costly engineering development. It appears that a very simple line drawing type of map will satisfy the user requirements rather than going to the far end of the spectrum of super detail survey type maps. The present display was considered adequate by the participants in the CEP. Even in its crudest state it was better than anything they had. Consideration may be given to providing the capability for the user to electronically draw a map display or add (and store details) as the situation dictates.

4. There should be a method whereby the user of any display can offset his position from center without distorting the presentation. This is particularly important should sector scan be required.

5. The keyboard entry device appears to be larger than required. Although obvious at the initial phases of design, it should not be immediately discarded. Future capabilities must be considered before extensive redesign of the keyboard is undertaken.

6. Provide a method for selective removal of data not wanted or required by the user. Occasionally, unwanted data, appeared on the Configuration C Display. This was caused by transients in the cable between the Plasma Display and its Control Pack. Removal of this data by completely erasing the display and starting over is not satisfactory.

7. Changing altimeter setting information should be a keyboard function rather than a separate control.

8. There should be provisions for "holding" the last known position of any aircraft that "disappears" from the display in memory until cleared by the operator. This should not be restricted to 7700 code aircraft.

9. Include a bezel and cursor on display.

10. Trail dots showing the history of a particular aircraft were repeatedly requested. There should be some method included whereby the controller can suppress the unwanted dots (or selectively call up the desired trail).

11. Rubber range. It is desirable to be able to fine tune the display slightly once the primary scale factor has been selected.

12. A capability to predict the targets path is desirable.

13. Collision warning to include estimated time to collision by combining path projection, range and range rate data.

14. Include the capability for the controller to insert information such as heliports, FAARPs, emergency landing zones, restricted areas, hospitals, etc.

15. [illegible] the controller to direct, leading [illegible] nearest emergency facility or safe landing area.

16. Overall lighting of the "C" configuration (to include adjustable illumination of the display) must be improved.

17. Eliminate the "continuous" roll on the "A" version thereby eliminating the tendency of users to [illegible] roller.

18. Consideration should be given to [illegible] a capability for the "C" version to accept position data from other sources such as JTIDS, etc.

PART III RECOMMENDATIONS AND CONCLUSIONS

CONCLUSIONS

The VLATME concept is viable. With a minimum of changes the equipment as configured will provide the basic building blocks for a command directed asset management system capable of contributing to the maximum effectiveness and survivability of Army aviation assets on a high threat battlefield. Integrating VLATME equipment into the overall command and control structure will permit efficient air space management in the varying degrees necessary without adding undue restrictions and with minimal adverse impact on the capabilities of any component.

RECOMMENDATIONS

A meeting should be scheduled with the principals as soon as possible after receipt of the VLATME CEP report. At a minimum representatives from TRADOC, USACC, Avionics Research and Development

Activity from the [illegible] meeting should be hosted by [illegible] at Fort Huachuca, Arizona. This should be a question and answer type working meeting resulting in a firm requirements document.

Prior to this meeting it is recommended that some work (within available dollar constraints) be undertaken to make the following changes in the VLATME "C" configuration. No changes are recommended for the "A" or "B" version at this time.

Add bezel and cursor.

Add trail dots.

Add rubber range and offset capability.

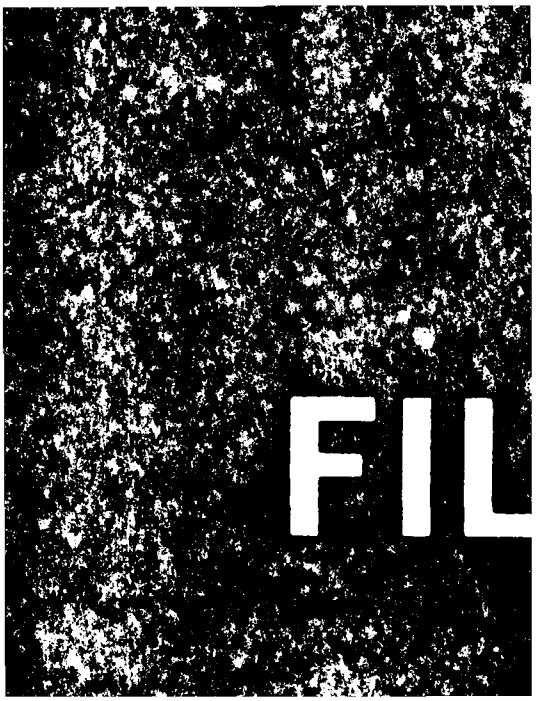
Add path projection and estimated time to collision.

Improve overall illumination.

Add capability for controller to add "targets" such as airfields, e

Add capability for controller to determine best "emergency field" within constraints provided by the pilot.

If these items cannot be accomplished or there are items which must be corrected as a result of the CEP final report, vendor staff should be ready to discuss cost of such improvements at any meetings held with the user.


FIL